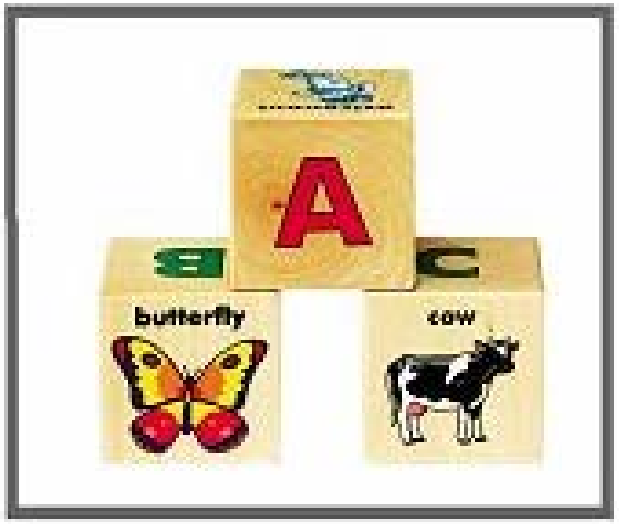
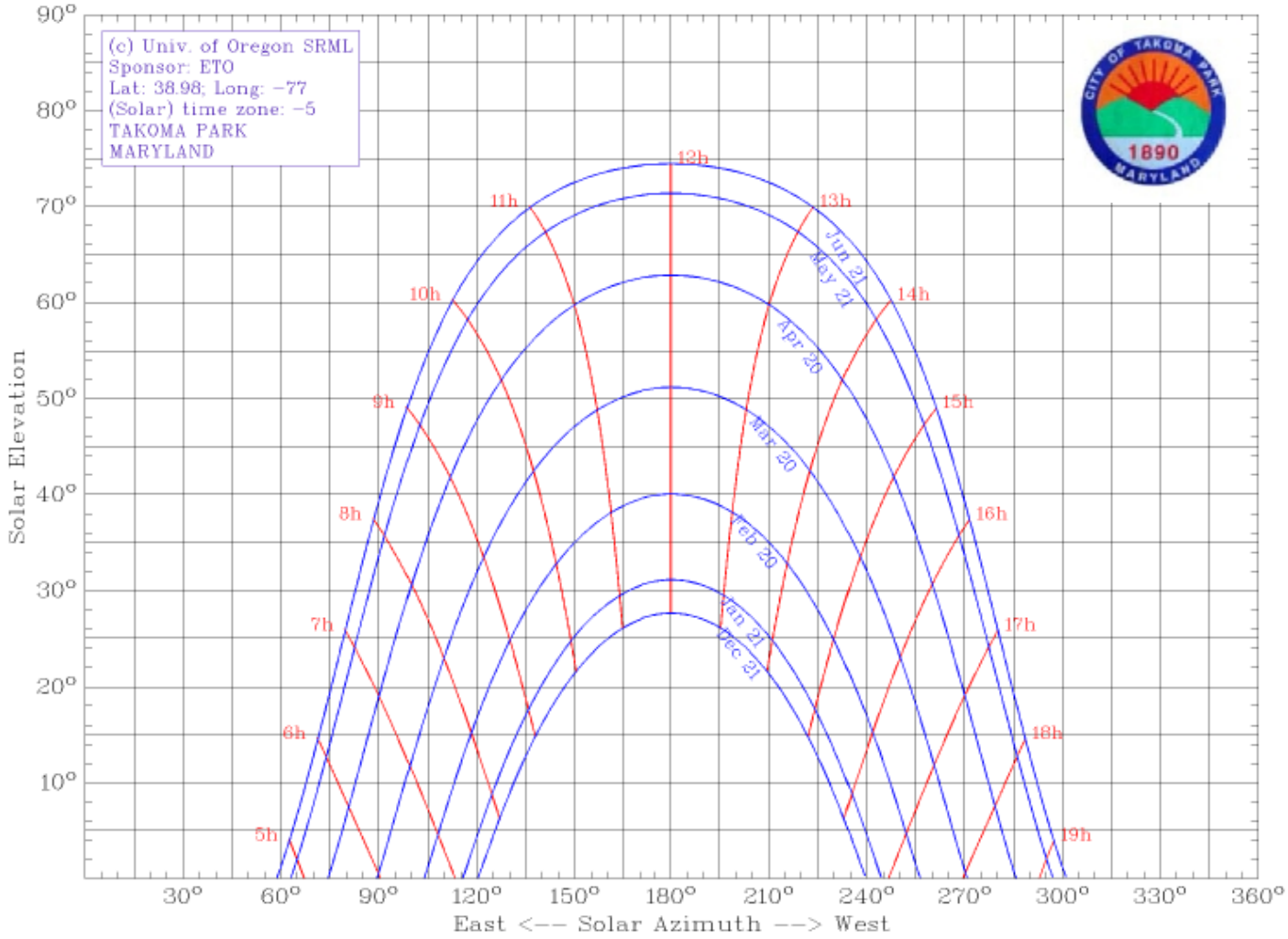


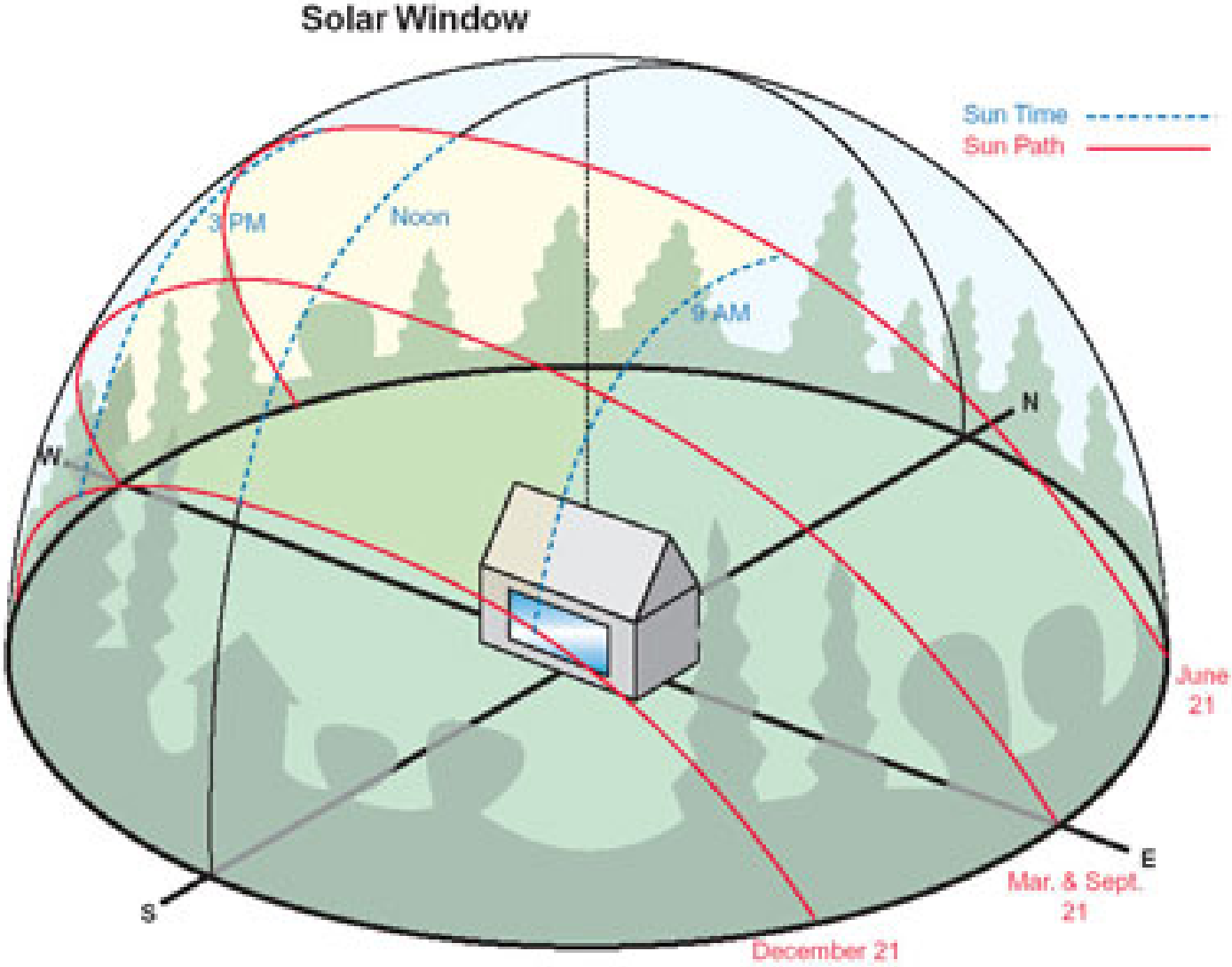
A, B, Cs of Active Solar Energy Systems

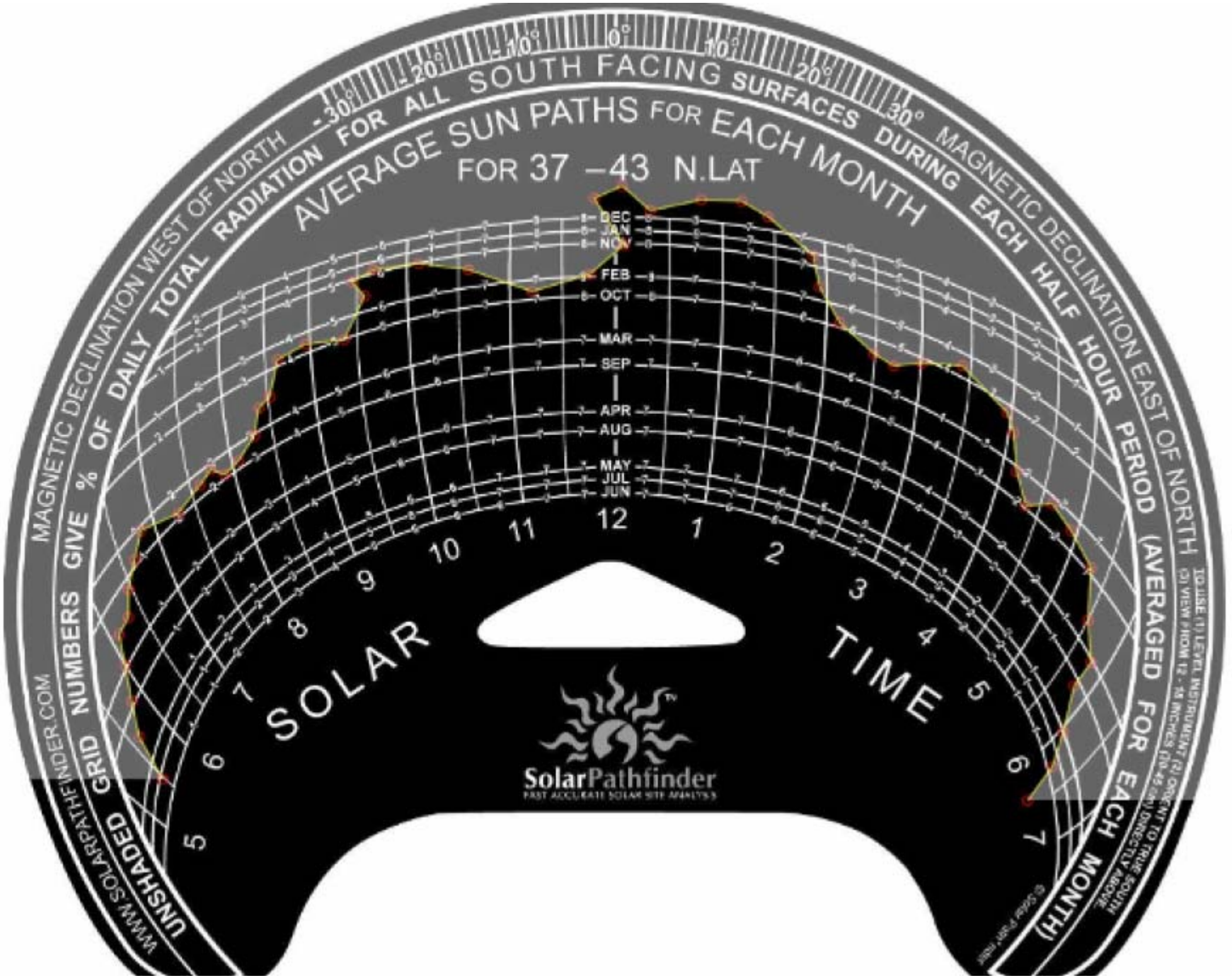
A. Is my property suitable for an active solar energy system?
B. What types of systems are there and how do they work?
C. What government incentives are available?

A. How to Determine If a Home or Business Is Suitable for a Solar Energy System

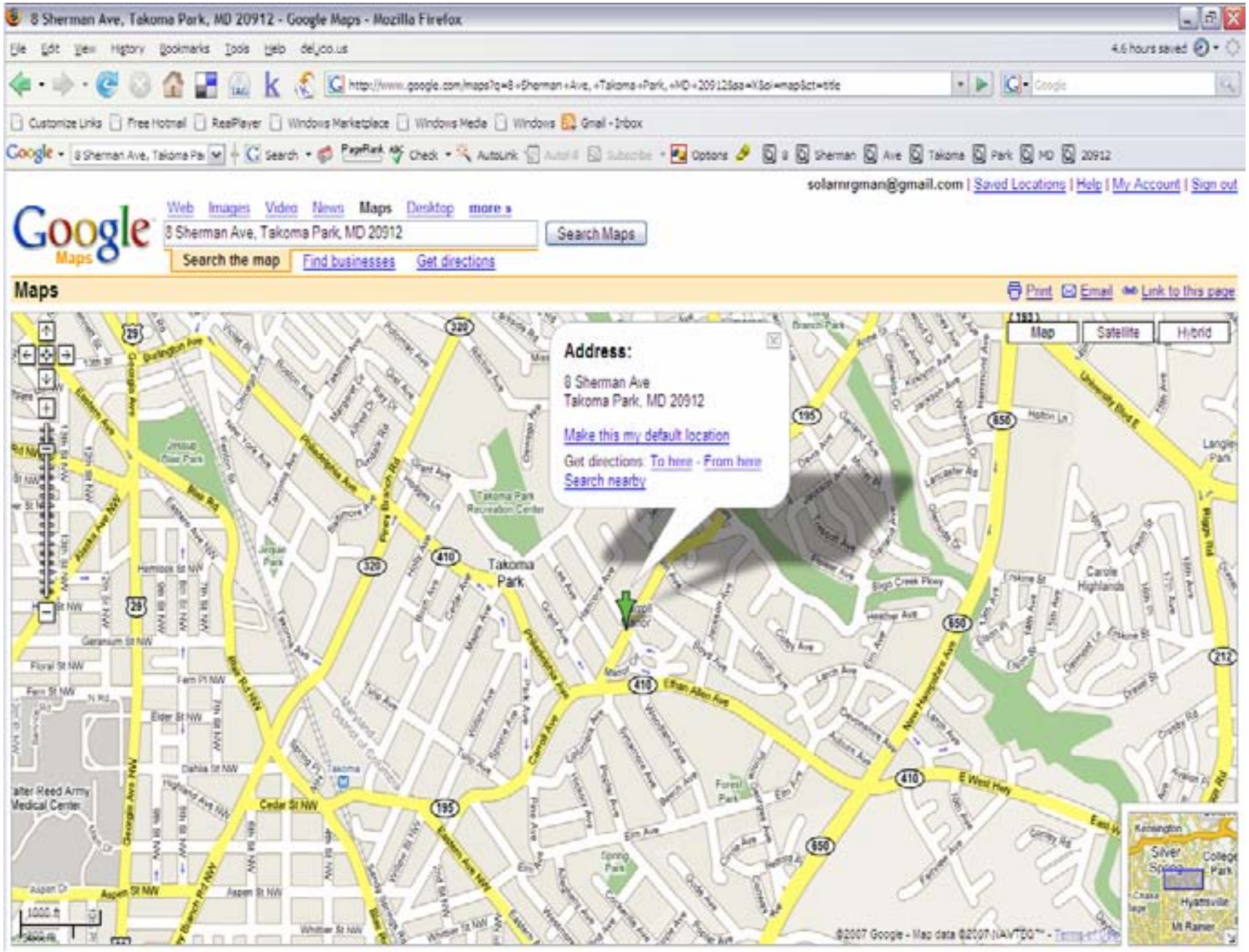
1. Is there an area to put solar collectors that is relatively, or preferably, totally shade free? Is there a south-facing roof area to mount the collectors on that has a clear “solar window”?


(c) Univ. of Oregon SRML
Sponsor: ETO
Lat: 38.98; Long: −77
(Solar) time zone: −5
TAKOMA PARK
MARYLAND
Solar Elevation
East <-- Solar Azimuth --> West
90°
80°
70°
60°
50°
40°
30°
20°
10°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
12h
11h
13h
10h
14h
9h
15h
8h
16h
7h
17h
6h
18h
5h
19h
Jun 21
May 21
Apr 20
Mar 20
Feb 20
Jan 21
Dec 21
CITY OF TAKOMA PARK
1890
MARYLAND


Solar Window
Sun Time
Sun Path
3 PM
Noon
9 AM
N
W
E
S
June 21
Mar. & Sept. 21
December 21


AVERAGE SUN PATHS FOR EACH MONTH
FOR 37 –43 N.LAT
AVERAGE SUN PATHS FOR EACH MONTH
FOR 37 –43 N.LAT
SOUTH FACING SURFACES DURING EACH HALF HOUR PERIOD (AVERAGED FOR EACH MONTH)
MAGNETIC DECLINATION EAST OF NORTH
-30° -20° -10° 0° 10° 20° 30°
MAGNETIC DECLINATION WEST OF NORTH
GIVE % OF DAILY TOTAL RADIATION FOR ALL
NUMBERS
GRID
UNSHADED
WWW.SOLARPATHFINDER.COM
DEC
JAN
NOV
FEB
OCT
MAR
SEP
APR
AUG
MAY
JUL
JUN
SOLAR TIME
5 6 7 8 9 10 11 12 1 2 3 4 5 6 7
SolarPathfinder
FAST ACCURATE SOLAR SITE ANALYSIS

2. One way to do a quick site analysis is to look up the property address on google.com > maps.google.com.


8 Sherman Ave, Takoma Park, MD 20912 - Google Maps - Mozilla Firefox
solarnrgman@gmail.com | Saved Locations | Help | My Account | Sign out
Google Maps
Web Images Video News Maps Desktop more »
8 Sherman Ave, Takoma Park, MD 20912
Search Maps
Search the map Find businesses Get directions
Maps
Print Email Link to this page
Address:
8 Sherman Ave
Takoma Park, MD 20912
Make this my default location
Get directions: To here - From here
Search nearby
Map Satellite Hybrid
Takoma Park
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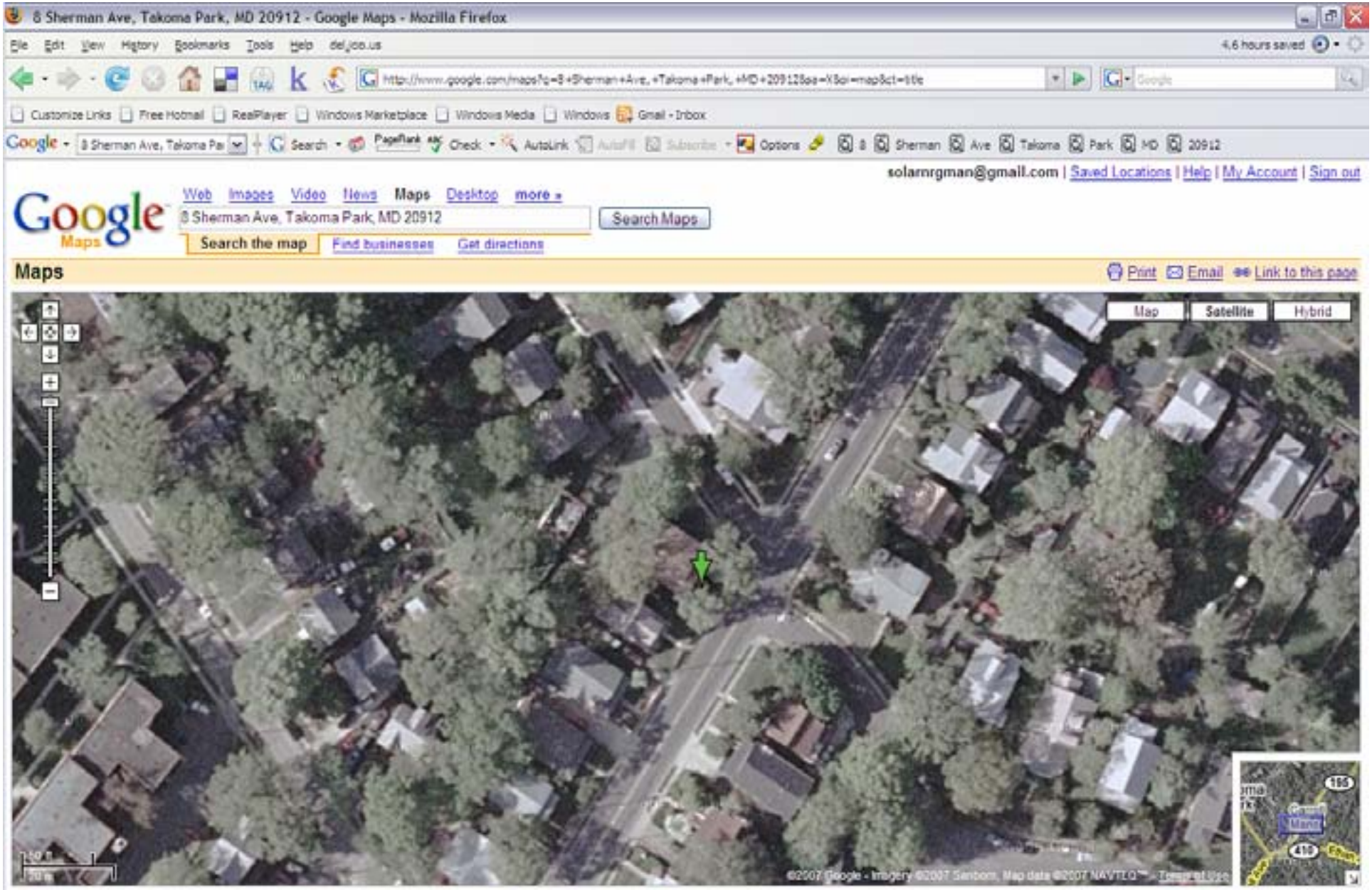
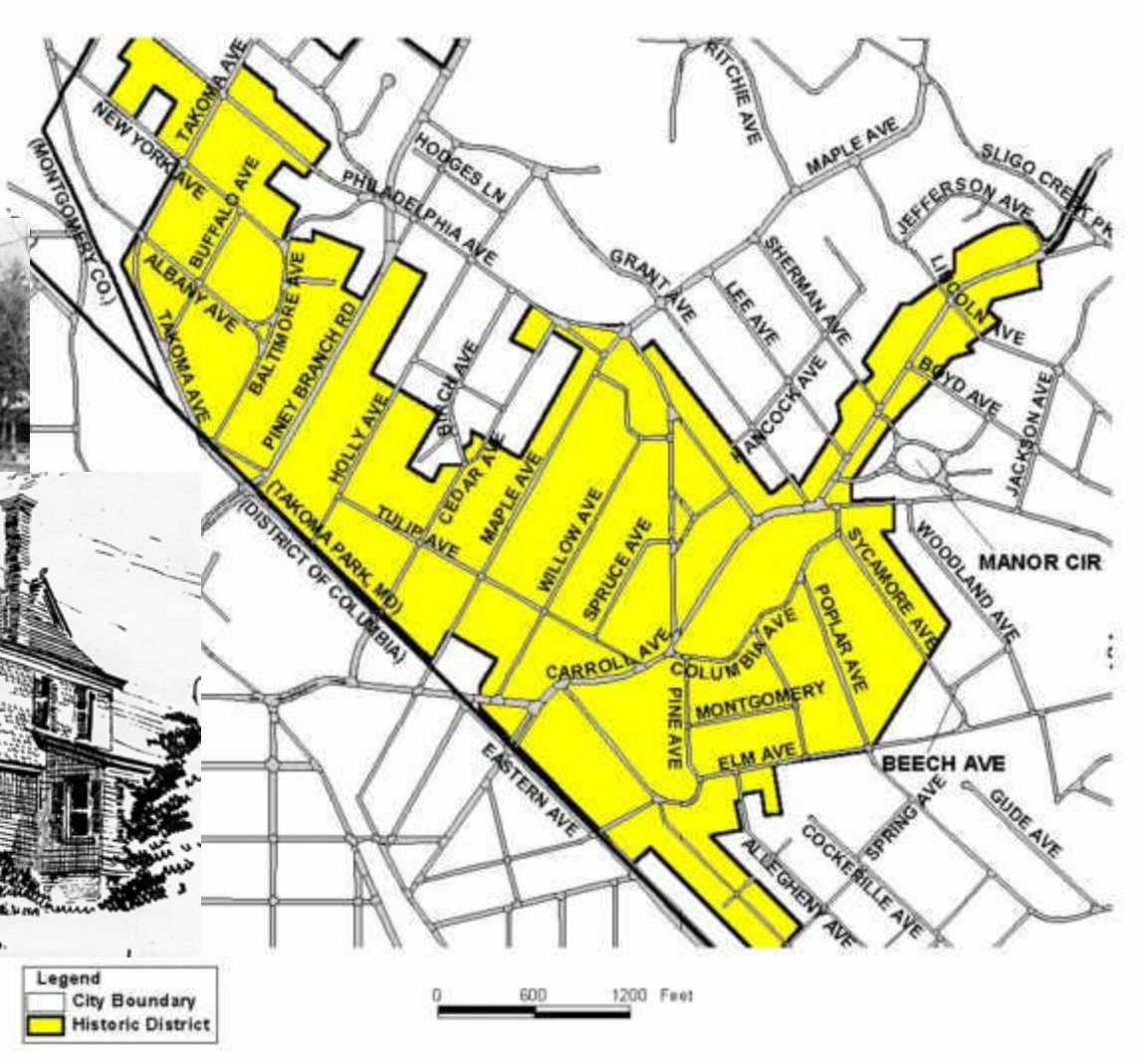

8 Sherman Ave, Takoma Park, MD 20912 - Google Maps - Mozilla Firefox
File Edit View History Bookmarks Tools Help del.icio.us
4.6 hours saved
Customize Links Free Hotmail RealPlayer Windows Marketplace Windows Media Windows Gmail - Inbox
Google 8 Sherman Ave, Takoma Pa Search Check AutoLink Options 8 Sherman Ave Takoma Park MD 20912
solarnrgman@gmail.com | Saved Locations | Help | My Account | Sign out
Google Maps
Web Images Video News Maps Desktop more »
8 Sherman Ave, Takoma Park, MD 20912
Search Maps
Search the map Find businesses Get directions
Maps
Print Email Link to this page
Map Satellite Hybrid
©2007 Google - Imagery ©2007 Sanborn, Map data ©2007 NAVTEQ™ - Terms of Use

3. Is the Property Designated a Contributing or Outstanding Resource in a Historic District? If so, then NO to solar on the streetscape façade.



4. The next step is to see if there are any solar obstructions to the south of where you are considering placing your solar collectors.

   Takoma Park-Silver Spring is an Urban Forest area, and thus there is a mature tree canopy that has to be respected.

5. Is there room for ancillary equipment?

If you determine that you have a good solar site that is mostly **shade free from 9:00 AM to 4:00 PM during winter days**, then you should next consider what type of solar collectors/system you will want to install.

B. Types of Solar Systems and How They Work

There are two basic types of solar systems to consider:

1. **Solar thermal systems** that make heat or hot water and
2. **Photovoltaic (PV) systems** that produce electricity.

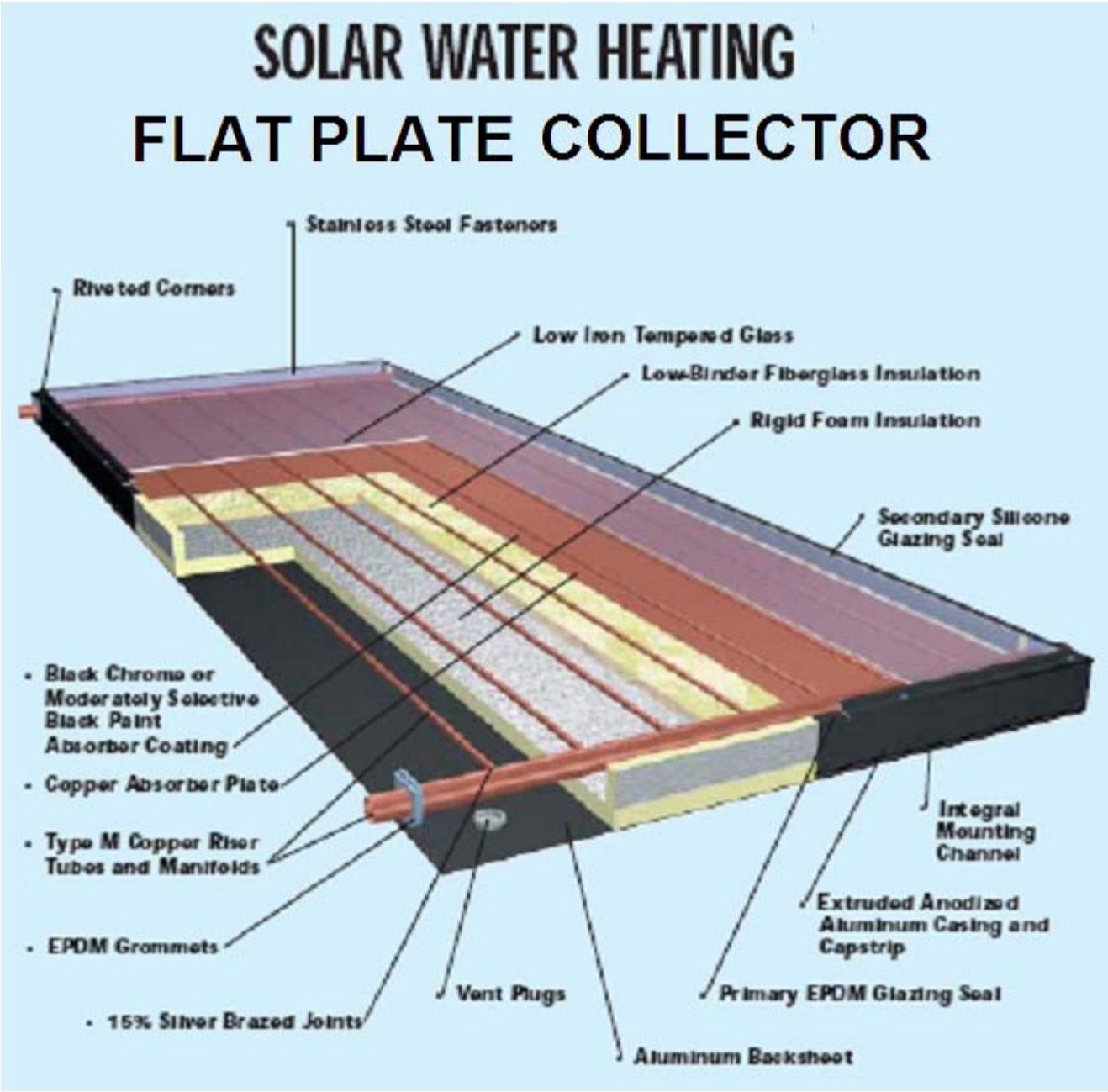
Solar Thermal Systems

- A solar thermal collector converts sunlight into heat.

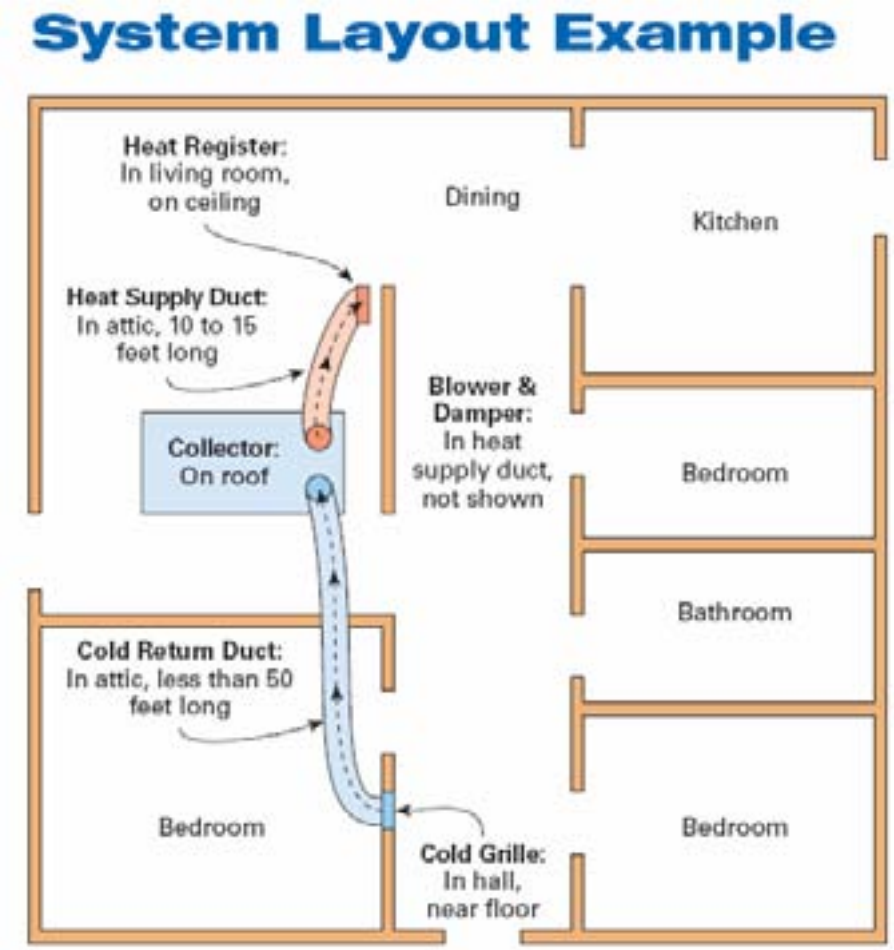
- The most common thermal system is **solar water heating.** This type typically has either a flat plate solar collector or a set of evacuated tubes that are roof-mounted.

SOLAR WATER HEATING

FLAT PLATE COLLECTOR



Solar Water Heating Systems

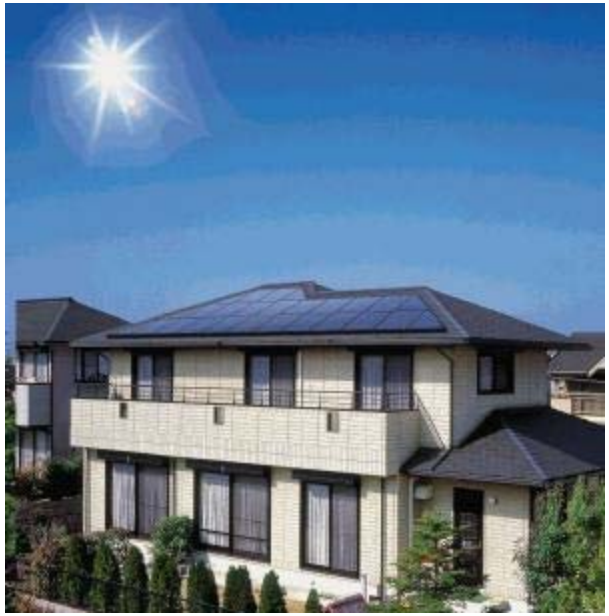


Solar Air Heating

- The second most common are **solar air heating systems**. These are almost always flat plate design and are typically glazed with either polymers or tempered glass.
- Space heating can be supplemented with solar hot air panels.

Photovoltaic (PV)

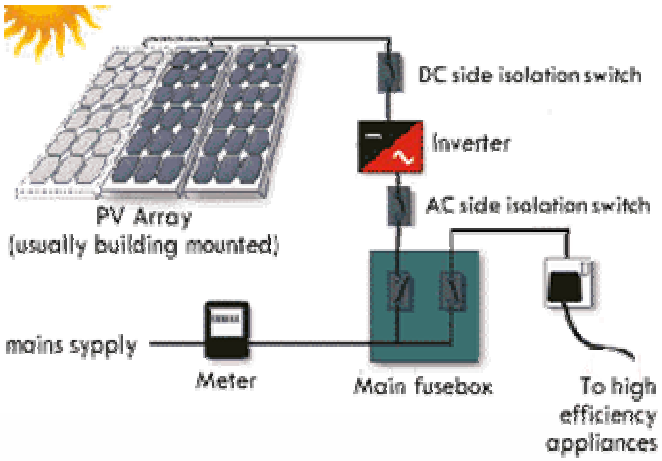
- PV panels produce electricity silently and without any pollution whenever the sun shines on them.

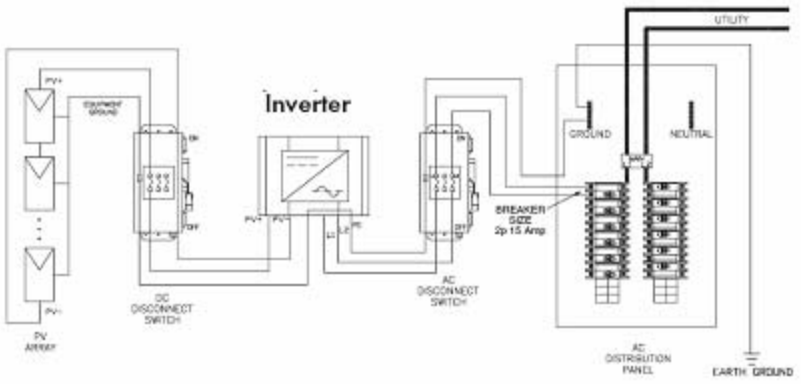


- Most PV systems are very shade intolerant. Any shadowing on the panels will disproportionately degrade the system's output. For example, 5% shading can cause an 85% loss of the system performance.

Solar Power – Grid Tied System

- A series of photovoltaic (PV) panels that are typically mounted on the roof of the building and then connected to an inverter that converts the solar generated direct current (DC) power to alternating current (AC) power and synchronizes it to the utility grid power. Your house can then use this electricity seamlessly or sell any surplus back to the utility. WITH GRID-TIE, IF THE UTILTIY GRID GOES DOWN THE SOLAR SYSTEM GOES DOWN TOO.



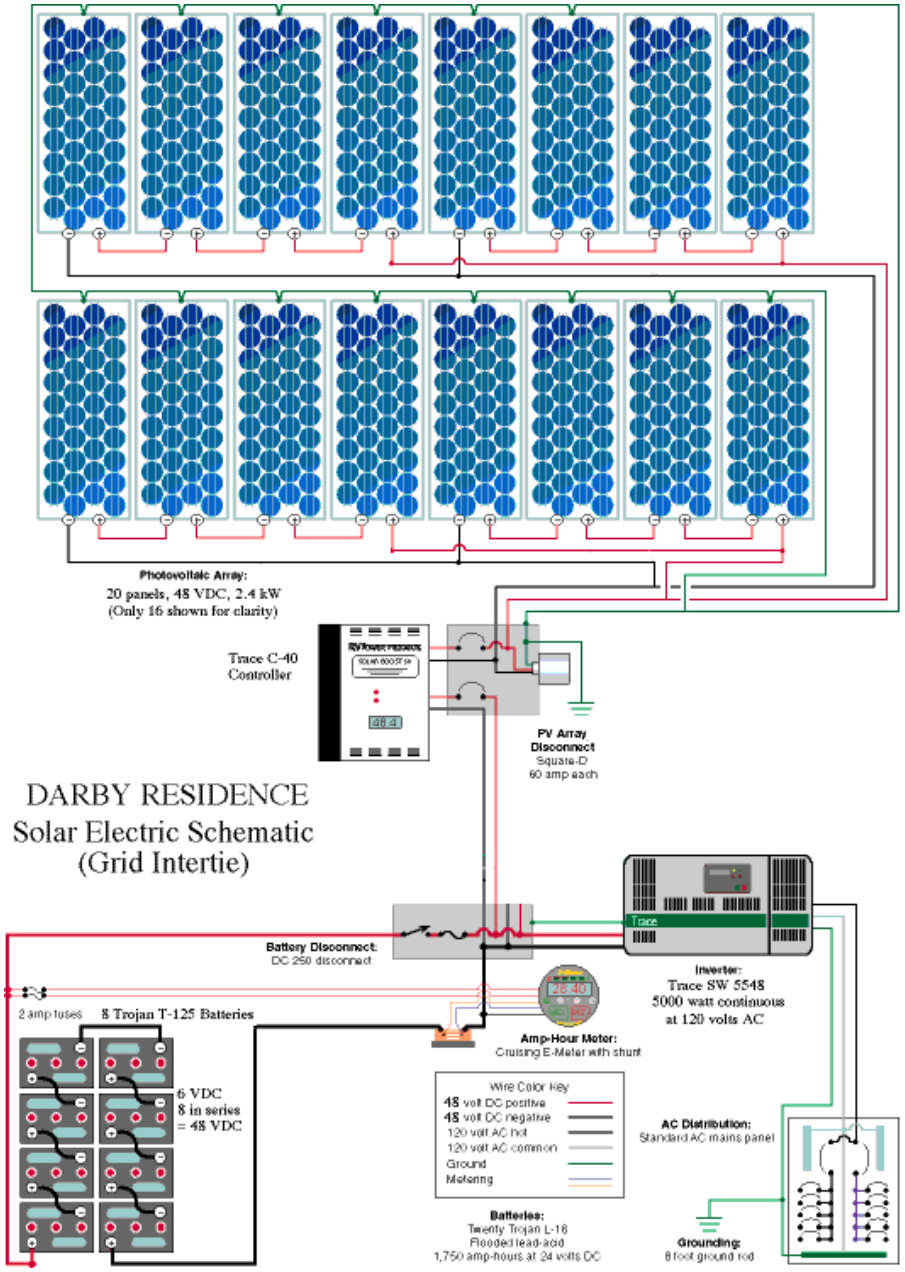


Generating Surplus Power

- So what happens if you building generates more power than it uses during the day?
- Any surplus power is actually fed back through the meter to the grid spinning your meter backwards. This results in you selling power back to the utility at the same kWh rate that you are buying power. This is known as **NET METERING** and is the law in Maryland, D.C. and Virginia**.**

Solar Grid-Tie with UPS

- It is possible to design and install a solar system that will provide the property with some limited emergency back up power in the event that the utility grid goes down. These systems are more costly and not quite as efficient as a straight grid-tied system but in some cases are worth considering. They require a battery bank to provide power when the grid power fails. This can be very important to small businesses to keep cash registers, communications and lights on.


Photovoltaic Array:
20 panels, 48 VDC, 2.4 kW
(Only 16 shown for clarity)
Trace C-40
Controller
PV Array
Disconnect
Square-D
60 amp each
DARBY RESIDENCE
Solar Electric Schematic
(Grid Intertie)
Battery Disconnect:
DC 250 disconnect
Trace
Inverter:
Trace SW 5548
5000 watt continuous
at 120 volts AC
2 amp fuses
8 Trojan T-125 Batteries
6 VDC
8 in series
= 48 VDC
Amp-Hour Meter:
Cruising E-Meter with shunt
Wire Color Key
48 volt DC positive
48 volt DC negative
120 volt AC hot
120 volt AC common
Ground
Metering
AC Distribution:
Standard AC mains panel
Batteries:
Twenty Trojan L-16
Flooded lead-acid
1,750 amp-hours at 24 volts DC
Grounding:
8 foot ground rod

C. Federal and State Incentives

- At this time there are federal and several state solar incentive programs available in our region.

Federal Solar Tax Credits

Residential Solar and Fuel Cell Tax Credit

- Incentive Type: Personal Tax Credit Eligible Renewable/Other Technologies: Solar Water Heat, Photovoltaics, Fuel Cells, Other Solar Electric Technologies
- Applicable Sectors: Residential Amount:30%Maximum Incentive:$2,000 for solar electric and solar water heating; $500 per 0.5 kW for fuel cells
- Carryover Provisions: Excess credit may be carried forward to succeeding tax year
- Eligible System Size: Not specified
- Equipment/Installation Requirements: Solar water heating property must be certified by SRCC or by comparable entity endorsed by the state. At least half the energy used to heat the dwelling's water must be from solar in order for the solar water heating property expenditures to be eligible. Authority 1: 26 USC § 25D Date Enacted:8/8/2005Effective Date:1/1/2006Expiration Date:12/31/2008

- Federal - Residential Energy Conservation Subsidy Exclusion (Personal)
- Incentive Type: Personal Exemption Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Photovoltaics
- Applicable Sectors: Residential, Multi-Family Residential
- Amount:100% of subsidy
- Website:http://www.irs.gov/publications/p525/index.html Authority 1: 26 USC § 136 (2005)

Maryland

Maryland's solar grant program offers-

- Solar water heating property: 20% of system costs up to a maximum grant amount of $2,000
- Residential photovoltaic property: 20% of system costs up to a maximum grant amount of $3,000
- Non-residential photovoltaic property: 20% of system costs up to a maximum grant amount of $5,000
- For additional information, email meainfo@energy.state.md.us or call 1-800-72ENERGY.

The District of Columbia

In December 2006, a total of $450,000 from the D.C. Reliable Energy Trust Fund -- was made available for demonstration projects featuring **solar photovoltaics (PV),** wind, biomass-fired combined heat and power (CHP), fuel cells, small hydropower facilities, geothermal-electric facilities, and other renewable-energy resources. *"A resource is called renewable if it can be naturally replenished. In general, renewables have lower emissions than non-renewables."*

- **Applications** for funding under this third round solicitation are **due April 2, 2007**. This program provides qualified applicants **up to 50 percent of the costs** associated with installing renewable energy generation resource.
- ***Note that solar-thermal systems are not eligible for funding under this solicitation.***

- Contact Emil King at emil.king@dc.gov or (202) 359-5924.

RENEWABLE ENERGY IS HOMELAND SECURITY

- Albert Nunez, CEM
- Email: solarnrgman@gmail.com
- Capital Sun Group, Ltd.
  6503 81st Street
  Cabin John, MD 20818
  301-229-0671
  301-229-0434 fax
  www.capitalsungroup.com

Federal - Business Energy Tax Credit

- Incentive Type: **Corporate Tax Credit**
- Eligible Renewable/Other Technologies: **Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics**, Geothermal Electric, Fuel Cells, **Solar Hybrid Lighting**, Direct Use Geothermal, Microturbines
- Applicable Sectors: Commercial, Industrial
- Amount: **For equipment placed in service from January 1, 2006 until December 31, 2008, the credit is 30% for solar, solar hybrid lighting**, and fuel cells, and 10% for microturbines. The geothermal credit remains at 10%.Maximum Incentive:$500 per 0.5 kW for fuel cells; $200 per kW for microturbines; no maximum specified for other technologies
- Eligible System Size: Microturbines less than 2 MW; fuel cells at least 0.5 kW

Federal Business Solar Tax Breaks

- **Federal - Modified Accelerated Cost-Recovery System (MACRS)**
- **Incentive Type: Corporate Depreciation Eligible Renewable/Other**
- **Technologies: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Wind, Geothermal Electric, Fuel Cells, Solar Hybrid Lighting, Direct Use Geothermal, Microturbines**
- **Applicable Sectors: Commercial, Industrial Authority 1: 26 USC § 168 (2005) Effective Date:1986**

- **Summary:** Under the Modified Accelerated Cost-Recovery System (MACRS), businesses can recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. For solar, wind and geothermal property placed in service after 1986, **the current MACRS property class is five years.** With the passage of the the Energy Policy Act of 2005, fuel cells, microturbines, and solar hybrid lighting technologies are now classified as 5-year property as well. 26 USC § 168 references 26 USC § 48(a)(3)(A) with respect to classifying property as "5-year property" and EPAct 2005 added these technologies definition of energy property in § 48 as part of the business energy tax credit expansion.

  For more information, see *IRS Publication 946, IRS Form 4562: Depreciation and Amortization*, and *Instructions for Form 4562*.